

Cryo-recanalization in a case of carcinoid tumor - An interesting case report

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ABSTRACT

The term “cryotherapy” comes from the Greek cryo (κρύο) meaning cold, and therapy (θεραπεία) meaning cure. Cryosurgery is the application of extreme cold to destroy abnormal or diseased tissue. Carcinoid tumors of the lung are a fascinating but uncommon group of pulmonary neoplasms. In the past, these tumors were grouped with benign or less aggressive malignant pulmonary tumors, namely bronchial adenomas. Recent studies have revealed that carcinoid lung tumors are the most indolent form of a spectrum of bronchopulmonary neuroendocrine tumors that, at its extreme, include small cell carcinoma of the lung as its most malignant member. They commonly present as endobronchial obstructions, and if complete, can be life-threatening and require immediate intervention.^[1] Recently, we have treated a patient of carcinoid tumor of lung who was managed with cryo-recanalization with excellent response.

KEY WORDS: Carcinoid tumor, cryo-recanalization, new intervention, video-bronchoscopy

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INTRODUCTION

Cryo-recanalization has attained its place in the management of malignant endobronchial obstruction, both with and without life-threatening obstruction of the airways. It is a cheap and effective method to achieve recanalization of the obstructed airway, and most safe as compared to other costly procedures.^[2]

Typical carcinoid tumors of the lung represent the most well-differentiated and least biologically aggressive type of pulmonary neuroendocrine tumor. These tumors characteristically grow slowly and tend to metastasize infrequently. Atypical carcinoid tumors have a more aggressive histologic and clinical picture. They metastasize at a considerably higher rate than do typical carcinoid tumors and, therefore, carry a poor prognosis.

We came across such a patient who had histologically proved carcinoid tumor of the lung. Patient presented with breathless on exertion and severe cough.

We are performing an advanced technique, cryo-recanalization, which has emerged for immediate debulking of exophytic endobronchial tumors.^[3] In this technique, the bronchoscopist retracts frozen tumor tissue at the tip of the cryo-probe through a bronchoscope and gradually removes it resulting in recanalization of the airway lumen. This technique is feasible and has many advantages, including its use with flexible bronchoscopes, immediate efficacy, and low risk of complications.^[4]

CASE REPORT

A 28-year-old non-smoker, non-diabetic, normotensive male was admitted to the hospital with complaints of cough and breathlessness for last 2 months. Cough was insidious in onset, non-productive and aggravated on lying down. Breathlessness gradually kept on progressing; initially it was with strenuous exercise, but now he feels breathless even on climbing stairs. There was no hemoptysis, fever, chest pain, loss of weight or weakness. There was no history of any other chronic disease. Family history was not significant.

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On examination patient's general condition was stable. Pulse was - 90/minute, BP - 124/82 mmHg and respiratory rate - 20/minute. On inspection respiratory movements were decreased on the left side of the chest along with reduced chest expansion. On palpation trachea was shifted to left with reduced vocal fremitus over axillary area and breath sounds were absent over left axillary, lower axillary, scapular, infra-scapular, mammary and infra-mammary regions.

Investigations showed Hb - 13.5 g/dl, TLC - 6460/mm³, DLC - P₆₁L₃₅E₀₃M₀₁. X-ray chest PA view done on admission (08-02-2014) showed homogenous opacity in the left mid and lower zones with ipsilateral pulling of mediastinum [Figure 1]. USG chest showed large areas of consolidation. CECT chest was done which showed intraluminal soft tissue density in left main bronchus [Figure 2]. Lung parenchyma distal to the obstruction was well aerated [Figure 3].

Fibreoptic bronchoscopy was performed which showed endobronchial pedunculated growth in left main

bronchus, [Figure 4], Bronchoscope could not be negotiated beyond the growth. Endobronchial biopsy was taken from the growth with minimal bleeding. Histopathology report revealed nonspecific inflammation. Video bronchoscopy guided cryo-biopsy was done for histopathology, which revealed neuroendocrine tumor Grade 1 [Figure 5]. IHC revealed tumor cells expressing synaptophysin and chromogranin. Cytokeratin expression is granular moderate intensity. Ki67 proliferation index <1% and negative for TTF 1. It was consistent with typical carcinoid tumor (neuroendocrine tumor Grade 1). Patient was planned for cryo-recanalization.

The video-bronchoscopic guided cryo-recanalization was done under conscious sedation after intubating the patient with 8 French gauge endotracheal tube. Flexible cryo-recanalization probe (90-cm long, 2.4-mm wide, ERBE, Medizintechnik GmbH, Tübingen, Germany) was inserted through the channel of therapeutic bronchoscope (Olympus, Japan). The procedures were performed with continuous oxygen flow at 4 L/min and SpO₂ was maintained between 94 and 96%.

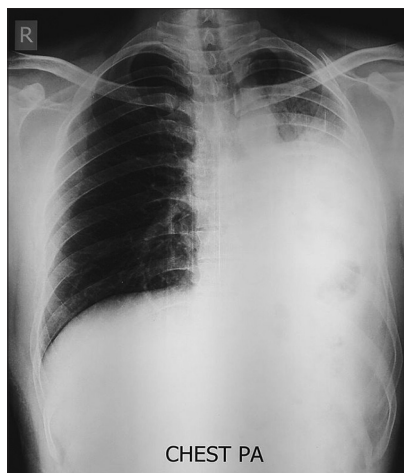


Figure 1: X-ray on admission showing left homogenous opacity and pulling of the mediastinum towards the same side

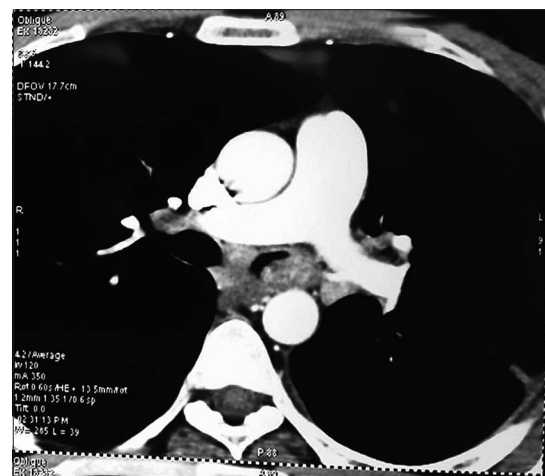


Figure 2: CT chest showing intraluminal soft tissue density in LMB

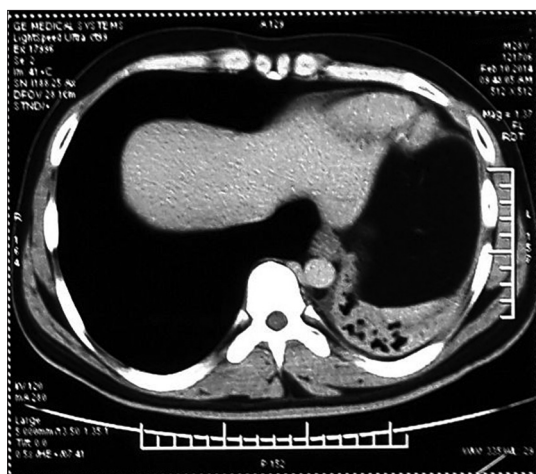


Figure 3: CT Chest showing well-aerated left lung distal to the obstruction



Figure 4: Bronchoscopic view of pedunculated growth in LMB with Cryo-Probe

The cryoprobe, guided through the working channel of the bronchoscope, was placed inside the tumor (1-2 cm). The probe tip was then cooled for 5 to 20 seconds. Freezing of the tumor tissue was endoscopically visible. Control of the ice front allowed good assessment of the local extension of tissue freezing. Before the ice front reached the healthy bronchial wall, frozen tumor tissue was extracted from its surrounding tissue by pulling strongly on the probe. Together with the bronchoscope, the tissue stuck to the tip of the cryoprobe was pulled out of the respiratory tract. Frozen tumor tissue was then released from the probe tip by thawing it in a water bath. The procedure was repeated till all of the tumor tissue causing stenosis from exophytic portions of the tumor had been removed. Mild bleeding was treated with topical application of adrenaline with xylocaine. Chest roentgenogram was taken, which showed marked improvement and reduction of opacification of the left lower lobe [Figure 6]. Bronchoscopy was repeated after 3 months, which did not show any re-stenosis.

DISCUSSION

Airway obstruction is a common feature of endobronchial tumors, presenting as dyspnea, cough, and hemoptysis. Recently, a new technique, cryo-recanalization, has evolved, in which the bronchoscopist freeze-kills the endobronchial tumor mass and keeps on removing the frozen, malignant tissue resulting in a very affordable de-bulking of the tumor and recanalization of the airway lumen.^[3-5] This technique has many advantages, including use of flexible probes, immediate clinical recovery and minimal complications. We performed cryo-recanalization in our patient and achieved excellent patency of the airway and marked improvement and reduction of opacification of the left lung [Figure 6].

There is a long list of conditions that are treated by cryosurgery, both benign and malignant, including moles, solar keratoses, warts, hemorrhoids, plantar

fasciitis (Jogger's heel) and fibromas. Several malignant conditions are also managed by cryosurgery, viz., liver cancer, retinoblastoma, prostate cancer, oral cancers, cervical neoplasia and lung cancers. Generally, all tumors that can be reached by the cryoprobes during an operation are manageable. Although found to be effective, this method of treatment is only appropriate for use against localized disease, and solid tumors larger than 1 cm and tiny, diffuse metastases cannot be handled with cryotherapy. In our patient, we were able to remove a sizeable chunk of the malignancy by cryosurgery.

Other therapeutic modalities, although have immediate clinical responses (argon plasma coagulation, laser and electrocautery), but are associated with significant complications, including bleeding, fire, airway perforation and re-stenosis.^[6] We did not come across any such untoward event. Hetzel *et al.* (2008) have observed that the tissue samples collected during the cryo-recanalization procedure are of high quality and much larger than conventional biopsy samples.^[7]

Reported restenosis rates after cryotherapy range between 24 and 28% occurring within 2 months to 4 years^[4,8] of the procedure. Our patient had no recurrence as seen on check bronchoscopy after 3 months.

Another advantage of cryotherapy is that O₂ may not be stopped during the procedure, as is mandated during other modalities.^[4,6] We maintained SpO₂ between 94 and 96% with O₂ flow during the procedure at 4-6 L/min. Also, large fragments of tissue are removed with a cryoprobe, which, besides achieving an excellent recanalization, also give a better chance to obtain a proper histopathological diagnosis.^[7]

Cryosurgery is advantageous both during the actual process and after the procedure. Patients who are not fit for general anesthesia are potential candidates for cryosurgery; only

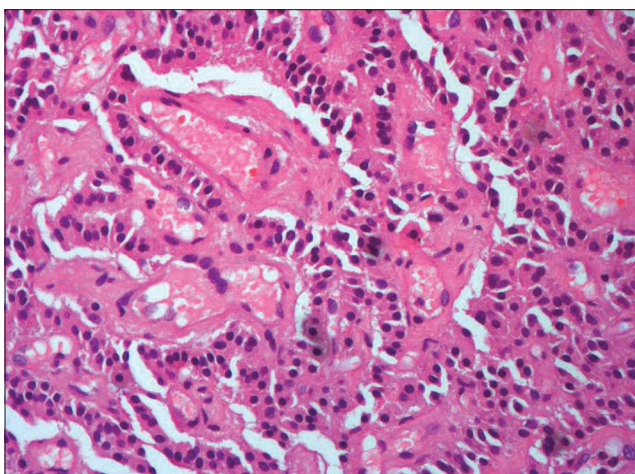


Figure 5: Cryo-biopsy (hematoxylin and eosin stain, 40 X) showing sheets of small round cells with uniform nuclei and cytoplasm



Figure 6: Post-OP CXR showing marked improvement and reduction of opacification of the left lung

a small incision through the skin or insertion of the cryoprobe is required to initiate the therapy; consequently, bleeding, pain and other complications of surgery are minimized. It is less expensive than other modalities and requires shorter recovery time and a shorter hospital stay. Also, there is least damage to the nearby healthy tissue and the procedure can be safely repeated. The only disadvantage of cryosurgery is that micro-metastases can be missed with this technique. Furthermore, in contrast to laser therapy, with its high-thermal energy release, cryo-recanalization can be performed in patients with coated airway stents.^[9] Another advantage of cryo is that it does not damage bronchial cartilage because of its lower water content.

On histopathological examination, the biopsy showed features of typical carcinoid tumor, that is monotonous sheets of small round cells with uniform nuclei and cytoplasm without pleomorphism^[10] [Figure 5]. Carcinoid tumors of the bronchial tree are not an unknown entity. Three-fourths of carcinoids are endobronchial and central, and present with post-obstructive pneumonia, hemoptysis, or wheezing, as was seen in the present case. Our patient did not have any symptoms or signs of carcinoid syndrome, which is known to occur in less than 2% of cases.^[11]

Virtual bronchoscopy and thin-slice computed tomography are excellent guides for patient selection.^[4] On CT, we had observed the distal healthy bronchial tubes before the procedure which helped in the favorable outcome. Interventions usually fail when the distal respiratory tract cannot be reached or tumor extends and grows back again.^[4] In our patient after the recanalization, we could successfully reach beyond the growth and visualize the carina and both of the bronchial bifurcations.

The most common complications of cryosurgery are bleeding, bronchial wall damage and hypoxia. We did not encounter any of such complication in our patient.^[2] Despite its high efficacy, low cost, and relative safety, this technique remains underutilized. The technique is easy to learn and has a low cost compared with other endobronchial treatment modalities. Thus, cryo-recanalization is a safe,

cheap and effective method for the immediate management of airway obstruction. Recently, this technique has gained its place in the treatment of malignant endobronchial obstructions both with and without critical airway narrowing.

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